



Original Contribution

Self-reported Experiences of Discrimination and Visceral Fat in Middle-aged African-American and Caucasian Women

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The authors examined the association between self-reported experiences of discrimination and subtypes of abdominal fat (visceral, subcutaneous) in a population-based cohort of African-American and Caucasian women. Prior studies examining associations between discrimination and abdominal fat have yielded mixed results. A major limitation of this research has been the reliance on waist circumference, which may be a poor marker of visceral fat, particularly for African-American women. Participants were 402 (45% African-American, 55% Caucasian) middle-aged women from the Chicago, Illinois, site of the Study of Women's Health Across the Nation. Visceral and subcutaneous fat were assessed via computed tomography scans between 2002 and 2005. Linear regression models were conducted to test associations among discrimination and visceral and subcutaneous fat. After adjustment for age and race, every one-point increase on the discrimination scale was associated with a 13.03-cm² higher amount of visceral fat ($P = 0.04$). This association remained significant after further adjustments for total body fat and relevant risk factors, including depressive symptoms. Discrimination was not associated with subcutaneous fat in minimally ($P = 0.95$) or fully adjusted models. Associations did not differ by race. Findings suggest that visceral fat may be one potential pathway through which experiences of discrimination increase cardiovascular risk.

African Americans; cardiovascular diseases; depression; discrimination (psychology); intra-abdominal fat; obesity, abdominal; waist circumference; women

Abbreviation: SWAN, Study of Women's Health Across the Nation.

Editor's note: A related article appears on page 1232, an invited commentary on the 2 articles is published on page 1240, and a response to the commentary by the authors of the first article is on page 1244. In accordance with Journal policy, the authors of the second article were asked whether they wanted to respond to the commentary, but they chose not to do so.

Several lines of evidence suggest that psychosocial stressors in the form of self-reported experiences of discrimination and interpersonal mistreatment may have a deleterious impact on cardiovascular health. Researchers have reported associations between experiences of discrimination

and elevated blood pressure (1–4), atherosclerosis (5, 6), inflammation (7, 8), and overall mortality (9). Findings have been particularly pronounced for African Americans (1, 6) but have been observed among Caucasians as well (7, 9). The pathways underlying associations between experiences of discrimination and cardiovascular health remain poorly understood, however. The current study was designed to examine the association between experiences of discrimination and one potential pathway—visceral fat—in a cohort of African-American and Caucasian women.

Visceral fat has been identified as an important risk factor for subsequent cardiovascular events, particularly among women (10, 11). Compared with other types of fat, such as total body or subcutaneous, visceral fat has been found

to be the most metabolically active, and is therefore considered the most “atherogenic,” component of fat (12). Among women, visceral fat has been associated with metabolic indices of cardiovascular risk, such as hypertension, hyperinsulemia, and dyslipidemia (13, 14). Psychosocial stressors are believed to contribute to the development of visceral fat (15, 16); however, to our knowledge, no studies have examined the association between experiences of discrimination and visceral fat.

Researchers have examined associations between experiences of discrimination and less sophisticated markers of visceral fat, such as waist and waist-hip ratio, and findings from these studies have been mixed, particularly for African-American women (17–19). Because measurements of waist and waist-hip ratio do not allow for a distinction between visceral and subcutaneous fat, studies examining associations between experiences of discrimination and these outcomes may not adequately capture the adiposity-related cardiovascular risk associated with experiences of discrimination. Furthermore, these measures may also overestimate or underestimate risk for African Americans compared with Caucasians. Among women in particular, studies have consistently found that, after adjustment for total body fat, African Americans actually have *lower* amounts of visceral fat compared with their Caucasian counterparts (20, 21).

In the current study, we hypothesized that higher reports of discrimination would be associated with a greater amount of visceral, but not subcutaneous, fat in a population-based cohort of over 400 middle-aged African-American and Caucasian women. To determine whether experiences of discrimination were independently associated with visceral fat, we controlled for a number of known correlates of visceral fat, including menopausal status, standard cardiovascular risk factors, physical activity, and depressive symptoms. Finally, because several previous studies have found more pronounced associations between experiences of discrimination and indices of cardiovascular disease for African Americans compared with Caucasians (1, 6), we also examined whether any observed associations differed by race.

MATERIALS AND METHODS

Participants

Participants were from the Chicago, Illinois, site of the Study of Women’s Health Across the Nation (SWAN). SWAN is a multisite, longitudinal cohort study of the menopausal transition (22). The Chicago cohort is population based, consisting of African-American and Caucasian women from 3 contiguous neighborhoods on Chicago’s south side. This area was chosen because it has an approximately equal distribution of socioeconomic status across the 2 racial groups, providing some design control for the commonly occurring confound between race and socioeconomic status. A complete census of this area was conducted in the early 1990s as part of an unrelated study (23). Using demographic information from this census, the Chicago SWAN site recruited a random sample of women from each race. Women were eligible for SWAN if they were aged

42–52 years, had an intact uterus, had at least one ovary, and reported a menstrual period in the preceding 3 months. Women who were pregnant, were breastfeeding, or reported exogenous hormone use in the 3 months preceding the baseline examination were ineligible. Of those eligible, 72% ($n = 868$) enrolled. The baseline SWAN examination began in 1996–1997.

Beginning in 2002, the Chicago site collected additional measures as part of an ancillary “Fat Patterning Study” designed to examine the association between the menopausal transition and visceral fat. The current analyses are based on the baseline Fat Patterning Study assessment, which took place from 2002 to 2005, corresponding to the fourth through ninth annual SWAN follow-up examinations.

Women eligible for the ancillary study were still transitioning through menopause, had not had a hysterectomy or oophorectomy, were not pregnant or planning to become pregnant, and were free of diabetes, chronic liver disease, and/or renal disease. Women who reported a history of anorexia nervosa or of alcohol or drug abuse were ineligible. Because of equipment limitations, women were also ineligible if they had breast implants, had a hip replacement, or weighed 299 pounds (135.7 kg) or more. Of those 386 SWAN participants eligible for participation in the Fat Patterning Study, 77% ($n = 297$) enrolled.

Because the Fat Patterning Study did not begin until the fourth follow-up examination of the parent SWAN study, many participants in the original SWAN cohort had completed the menopausal transition. Thus, 138 pre- and perimenopausal women (65% of those eligible), who were screened for SWAN but were too young to participate in 1996, were recruited to the Fat Patterning Study. These younger women did not differ from previously recruited women on race, education, discrimination, body mass index, or age-adjusted total or visceral fat. The final cohort consisted of 435 women. Because of equipment malfunctions, data on visceral fat were missing for 3 women. To reduce the likelihood of reverse causality (people with more body fat reporting higher levels of discrimination (24)), we excluded an additional 30 participants who reported discrimination because of weight. The current analyses are based on 402 women (182 African American, 220 Caucasian).

Procedure

Beginning with the baseline SWAN examination and annually thereafter, each participant completed a standard protocol including self- and interviewer-administered questionnaires, clinical tests, and a fasting blood and urine collection obtained between the second and fifth days of her menstrual cycle. In addition to the standard SWAN protocol, participants in the Fat Patterning Study also underwent dual-energy x-ray absorptiometry scans and computed tomography scans of the abdomen to assess fat patterning characteristics. The 138 women who participated in only the Fat Patterning Study completed the same protocol as SWAN women during a separate assessment. Table 1 details the timing of assessments completed for women from the Chicago SWAN site compared with the 138 Fat-Patterning Study participants.

Table 1. Assessment of Primary Measures for African-American and Caucasian Women in the Original Chicago, Illinois, SWAN Cohort Compared With Participants in Only the Fat Patterning Study

	Chicago SWAN Participants (N = 297)			Chicago Participants in Only the Fat Patterning Study (N = 138) ^a		
	SWAN Baseline (1996–1998)	Fat Patterning Study Baseline (2002–2005)	Other	SWAN Baseline (1996–1998)	Fat Patterning Study Baseline (2002–2005)	Other
Demographic variables (race, education)	X				X	
Discrimination			X ^b		X	
Visceral fat		X			X	
Subcutaneous fat		X			X	
Total body fat		X			X	
Sex hormone-binding globulin		X			X	
Framingham Risk Score		X			X	
Physical activity			X ^c		X	

Abbreviation: SWAN, Study of Women's Health Across the Nation.

^a All variables (e.g., discrimination, visceral fat) were assessed at Fat Patterning Study baseline for these 138 women.

^b Third or seventh follow-up examination.

^c The study visit closest to fat patterning assessment.

Study procedures were approved by the institutional review board at Rush University Medical Center (Chicago, Illinois). All participants provided written informed consent.

Measures

Discrimination. Discrimination was assessed with a 10-item version of the Detroit Area Study Everyday Discrimination Scale (25). This scale asked participants to indicate how often they experienced various forms of day-to-day mistreatment over the previous 12 months. Examples include, “You are treated with less respect than other people” and “You receive poorer service than other people at restaurants or stores.” Items are framed without reference to race, ethnicity, or gender. The frequency of each type of mistreatment was assessed with a 4-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often), summed, and averaged (i.e., divided by 10), resulting in a possible score of 1.0–4.0. Because reports of everyday discrimination have been found to be fairly stable across time in the SWAN cohort (5), it is not assessed every year. Discrimination was assessed at the third and seventh follow-up examinations for SWAN women, and the value closest to the Fat Patterning Study assessment was used in all analyses. Discrimination was assessed at the time of the fat patterning assessment for women who participated in only the Fat Patterning Study.

Visceral and subcutaneous fat. Computed tomography scans (Lightspeed VCT scanner, General Electric, Milwaukee, Wisconsin) were used to measure visceral and subcutaneous fat. Participants were examined in the supine position, with both arms on their chests, during the first 12 days of their menstrual cycle. After a scout view, a single 10-mm-thick image of the abdomen at the L4–L5 vertebral space was obtained. A trained radiologist unaware of participants' characteristics used a cursor to delineate the area

within the muscle wall surrounding the abdominal cavity (26, 27). This area was considered the “total abdominal fat area.” Visceral fat was defined as all adipose tissue within this area with an attenuation range between –190 and –30 Hounsfield units (26). Subcutaneous fat was calculated by subtracting the visceral fat area from the total abdominal fat area (27). Scans were read at the University of Colorado Health Sciences Center using software developed by the reading center (RSI Inc., Boulder, Colorado), utilized in several large cohort studies (28, 29).

Total body fat. Whole-body dual-energy x-ray absorptiometry scans were performed using a General Electric Lunar Prodigy scanner (GE-Lunar, Madison, Wisconsin). Participants were examined in a hospital gown in the supine position, with both arms by their sides after removing all clothing, shoes, and metal objects. Scans were analyzed using GE-Lunar enCORE software. Total body fat was quantified as the percentage of fat in the total body, calculated as total fat mass/(total fat mass + fat-free mass).

Body size characteristics. Body mass index was included for descriptive purposes and was calculated as weight in kilograms divided by height in meters squared. Waist circumference was included in secondary analyses and was measured to the nearest 0.1 cm with a measuring tape around the narrowest part of the torso.

Covariates. Race was self-reported as non-Hispanic African American or non-Hispanic Caucasian (referent). Age and education were assessed as standard demographic covariates and were self-reported in years. Sex hormone-binding globulin, a correlate of visceral fat (30), was assessed as a marker of menopausal status and was measured by a competitive chemiluminescent assay.

Standard cardiovascular risk factors were assessed with the Framingham Risk Score, using the standard algorithm for women that incorporates age, current cigarette smoking, systolic blood pressure, hypertension treatment, total

cholesterol, and high density lipoprotein cholesterol (31). Components of the Framingham Risk Score were assessed as follows: 1) current smoking was self-reported as yes/no; 2) systolic blood pressure readings were taken twice for each participant using standardized methods, and the average score was used; 3) antihypertensive medication use was self-reported and was verified via medication inspection; and 4) total cholesterol and high density lipoprotein cholesterol measurements were analyzed using standard procedures (32, 33). Physical activity, a known correlate of visceral fat (34), was self-reported using an adapted version of the Kaiser Physical Activity Survey, a continuous measure of physical activity (35). Because of the consistently strong associations between experiences of discrimination and depressive symptoms (36), and the previously documented associations between depressive symptoms and visceral fat in this and other cohorts (37, 38), depressive symptoms were also assessed with the Centers for Epidemiologic Studies Depression Scale (39). All covariates other than race were modeled continuously in all analyses.

Data analyses

Descriptive statistics were used to characterize the sample. All outcomes were assessed for normality; no transformations were necessary. *T* tests and chi-square tests were conducted to examine differences in sample characteristics by race. A series of linear regression analyses were conducted to assess the cross-sectional relation between experiences of discrimination and visceral fat. A preliminary, unadjusted model examined the crude association between discrimination and visceral fat. The primary, core model followed this model and included basic adjustments for age as a standard demographic covariate, and race—because of the previously documented associations between race and discrimination and race and visceral fat. A third model added a term for total body fat to assess the independent effects of experiences of discrimination on visceral (rather than overall) fat. The final model added terms for education, sex hormone-binding globulin, the Framingham Risk Score, physical activity, and depressive symptoms. Finally, a race \times discrimination interaction term was added to test for racial differences in the association between experiences of discrimination and visceral fat. Following these models, a second series of multiple regression analyses were conducted using the same sequence, with subcutaneous fat as the outcome.

The length of time between measurement of discrimination and assessment of visceral fat varied for women in the current study; consequently, we ran sensitivity analyses controlling for the length of time between assessment of discrimination and visceral fat. Models with and without this variable produced the same results; thus, this variable was not retained in final analyses.

Secondary analyses

To adequately compare our results with the results of prior studies, we also examined the association between

experiences of discrimination and waist circumference. Models were conducted utilizing the sequence detailed above. All analyses were performed using SPSS version 15 software (SPSS, Inc., Chicago, Illinois); all statistical tests were 2-tailed.

RESULTS

Participant characteristics

Women were on average 51 years of age, with an age range of 42–61 years. Participants were well educated, with approximately 15.9 (standard deviation, 2.03) years of education. The average Framingham Risk Score was 10.48 (standard deviation, 4.23); 20% of women were current smokers, 38% of women were obese (body mass index ≥ 30), and the average score on the physical activity scale was 7.7 (standard deviation, 1.62). Scores on the discrimination scale ranged from 1.0 to 3.0, with an average score of 1.63 (standard deviation, 0.44).

Table 2 presents characteristics of the sample by race. There were no significant racial differences in age or education, but African-American women reported more experiences of discrimination than their Caucasian counterparts did. As previously reported in this cohort (20), compared with Caucasian women, African-American women had more total body fat, a greater amount of unadjusted subcutaneous fat, and a similar amount of unadjusted visceral fat. After adjustment for total body fat, African-American women continued to have a greater amount of subcutaneous fat but had less visceral fat than Caucasian women did. Compared with Caucasian women, African-American women also had higher Framingham Risk Scores, lower levels of physical activity, more depressive symptoms, higher body mass indices, and a slightly, but nonsignificantly, higher prevalence of current smoking (Table 2).

Experiences of discrimination and visceral and subcutaneous fat

Final results from primary analyses of discrimination and visceral and subcutaneous fat are detailed in Table 3. Results differed for visceral and subcutaneous fat. In the preliminary, unadjusted linear regression models, experiences of discrimination were positively associated with levels of visceral fat (Table 3, model 1). Findings were stronger in the core model after accounting for the effects of age and race (estimate = 13.03, $P = 0.04$), indicating that for every one-point increase on the discrimination scale, there was a 13.03-cm² higher amount of visceral fat (Table 3, model 2). An additional adjustment for total body fat further strengthened this association (Table 3, model 3). Findings remained significant after additional adjustments for education, sex hormone-binding globulin, the Framingham Risk Score, physical activity, and depressive symptoms (Table 3, model 4). The race \times discrimination interaction term was nonsignificant ($P = 0.18$), indicating that associations between experiences of discrimination and visceral fat did not differ for African-American compared with Caucasian women.

Table 2. Selected Participant Characteristics by Race/Ethnicity for African-American and Caucasian Women, SWAN Fat Patterning Study Baseline, 2002–2005, Chicago, Illinois

Variable	African American (N = 182; 45%)		Caucasian (N = 220; 55%)		P Value ^a
	%	Mean (SD)	%	Mean (SD)	
Age, years		50.6 (4.04)		50.5 (3.63)	0.69
Education, years		15.7 (1.98)		16.08 (2.06)	0.10
Discrimination		1.78 (0.45)		1.51 (0.39)	<0.0001
Visceral fat, cm ² (unadjusted)		94.14 (57.35)		94.85 (48.25)	0.90
Visceral fat, cm ² (adjusted for total body fat) ^b		88.37 (3.25)		99.50 (2.95)	0.01
Subcutaneous fat, cm ² (unadjusted)		440.93 (166.10)		342.48 (144.16)	<0.0001
Subcutaneous fat, cm ² (adjusted for total body fat) ^b		407.58 (6.05)		369.33 (5.50)	<0.0001
Total body fat		45.37 (7.70)		40.94 (8.38)	<0.0001
Sex hormone-binding globulin, nM		52.59 (29.55)		57.6 (34.96)	0.13
Framingham Risk Score		11.10 (4.07)		9.97 (4.3)	0.008
Current smoker, % ^c	24		17		0.07
Physical activity		7.20 (1.59)		8.22 (1.50)	<0.0001
Depressive symptoms		7.63 (7.78)		5.84 (6.54)	0.01
Waist circumference, cm		93.80 (13.30)		86.51 (13.03)	<0.0001
Body mass index, kg/m ²		30.90 (7.45)		26.99 (5.48)	<0.0001
Obese, %	54		25		<0.0001

Abbreviations: SD, standard deviation; SWAN, Study of Women's Health Across the Nation.

^a T tests and chi-squared tests for racial differences.

^b Adjusted values are expressed as mean (standard error).

^c Assessed as part of the Framingham Risk Score, presented here for descriptive purposes.

Experiences of discrimination were associated with levels of subcutaneous fat in the preliminary model (Table 3, model 1), but associations were no longer significant in the core model that adjusted for age and race (Table 3,

model 2). The reduction in the association was primarily due to the strong effects of race on both reports of discrimination and levels of subcutaneous fat (refer to Table 2), underscoring the importance of adjusting for race in these

Table 3. Linear Regression Models Examining Associations Between Self-reported Experiences of Discrimination and Subtypes of Abdominal Fat (Visceral and Subcutaneous) in Middle-aged African-American and Caucasian Women, SWAN Fat Patterning Study Baseline, 2002–2005, Chicago, Illinois

	Visceral Fat, cm ²		Subcutaneous Fat, cm ²	
	Estimate (SE)	P Value	Estimate (SE)	P Value
Model 1 (preliminary model) ^a				
Discrimination	11.92 (6.07)	0.05	36.31 (9.94)	0.05
Model 2 (core model) ^b				
Discrimination	13.03 (6.19)	0.04	1.25 (18.34)	0.95
Model 3 (core model adjusted for total body fat) ^c				
Discrimination	14.13 (5.06)	0.005	5.65 (9.61)	0.56
Model 4 (fully adjusted model) ^d				
Discrimination	10.34 (5.05)	0.04	5.37 (10.61)	0.61

Abbreviations: SE, standard error; SWAN, Study of Women's Health Across the Nation.

^a Crude association, no adjustments.

^b Adjusted for age and race.

^c Adjusted for age, race, and total body fat.

^d Adjusted for age, race, total body fat, education, sex hormone-binding globulin, the Framingham Risk Score, physical activity, and depressive symptoms.

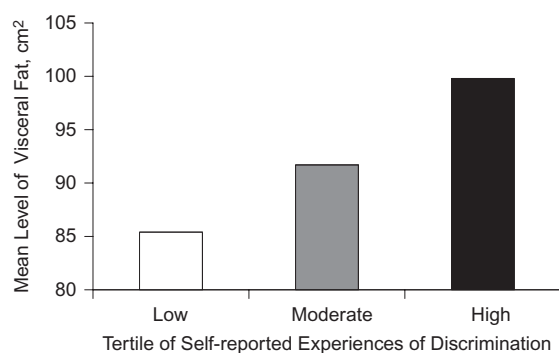


Figure 1. Estimated marginal mean levels of visceral fat, taken from fully adjusted linear regression models, by tertile of self-reported experiences of discrimination in middle-aged African-American and Caucasian women, SWAN Fat Patterning Study baseline, 2002–2005, Chicago, Illinois. Low discrimination scores: ≤ 1.44 , moderate scores: 1.45–1.88, high scores: ≥ 1.89 . SWAN, Study of Women's Health Across the Nation.

analyses. Associations between discrimination and subcutaneous fat remained nonsignificant after adjusting for total body fat (Table 3, model 3) and in fully adjusted models (Table 3, model 4). The race \times discrimination interaction term for subcutaneous fat was also nonsignificant ($P = 0.68$).

The association between experiences of discrimination and visceral fat is illustrated in Figure 1. Discrimination scores are categorized into approximate tertiles for descriptive purposes, with “low” scores ≤ 1.44 , “moderate” scores of 1.45–1.88, and “high” scores ≥ 1.89 . This figure depicts a graded association between experiences of discrimination and visceral fat, where each higher level of discrimination is associated with a greater amount of visceral fat.

Secondary analyses: experiences of discrimination and waist circumference

In secondary linear regression models adjusted for age and race (core model), experiences of discrimination were not significantly associated with waist circumference (estimate = 1.57, $P = 0.33$). The association remained nonsignificant in the fully adjusted model ($P = 0.25$). The race \times discrimination interaction term was also nonsignificant ($P = 0.14$).

DISCUSSION

We found a significant association between self-reported experiences of discrimination and visceral fat in a population-based cohort of middle-aged African-American and Caucasian women. Higher levels of discrimination were associated with a greater amount of visceral fat, independent of a number of known correlates of visceral fat, including total body fat, the Framingham Risk Score, physical activity, and, of particular note, depressive symptoms. No significant associations were found between experiences of discrimination and subcutaneous fat in minimally or fully adjusted models, suggesting that experiences of discrimination are uniquely associated with visceral fat rather than abdominal fat overall.

Associations between experiences of discrimination and visceral fat did not differ by race. Consistent with prior reports from SWAN and other cohorts, African-American women in our sample reported more experiences of discrimination than Caucasians did (6, 40), and they had higher body mass indices (41), more total body fat (42), more subcutaneous fat (42), and lower amounts of total body-adjusted visceral fat (21). Yet, the effect of discriminatory experiences on visceral fat was the same for both racial groups. This finding was somewhat surprising, because prior studies from SWAN have found stronger associations between discrimination and cardiovascular outcomes among African-American women compared with Caucasians (6, 43). However, a recent meta-analysis suggests that, although racial differences have been found in some studies, the overall impact of experiences of discrimination on health is similar across racial groups (44). In this respect, our findings are consistent with prior research.

To our knowledge, this study is the first to examine the association between experiences of discrimination and subtypes of abdominal fat. Prior studies examining the association between discrimination and abdominal fat have focused exclusively on waist circumference or waist-hip ratio (17–19) rather than on computed tomography-assessed visceral and subcutaneous fat. Much of the research in this area has been on African-American women, and findings have been mixed, with one study reporting an inverse association (19), another reporting a positive association (17), and a third reporting a null association (18). The one study that included Caucasian women found associations between experiences of discrimination and waist among Caucasians as a whole, but these associations appeared to be primarily driven by associations among Caucasian men (18).

We did not observe significant associations between experiences of discrimination and waist or waist-hip ratio (data not shown) in the current study. Waist circumference, and to a lesser extent waist-hip ratio, are widely used in epidemiologic cohort studies because they are less costly and time intensive to measure than computed tomography-assessed abdominal fat. However, the lack of association between discrimination and these outcomes in our cohort suggests that waist and waist-hip ratio may be inadequate proxies for visceral fat in studies of discrimination and abdominal fat. The inconsistent findings from prior studies noted above (17–19) may be largely due to their less precise measurement of visceral fat.

We conducted exploratory analyses (data not shown) to determine whether associations with visceral fat differed by the type of discrimination reported. Although the discrimination scale used in the current study was designed to measure discriminatory experiences across racial groups without reference to race, ethnicity, gender, or other categorizations (25, 45), it remains unclear whether certain attributions matter more for health outcomes than others (45). We were able to examine these associations in only a subset of women ($n = 181$) because only women who responded “sometimes” or “often” to items on the discrimination scale were asked to make an attribution. Consistent with prior studies of discrimination and cardiovascular health

(5), findings revealed no significant differences in levels of visceral fat between women who attributed their experiences to race or ethnicity and those who did not. Similar results were observed for gender discrimination, although a smaller number of women made this attribution. We were unable to examine all possible attributions for discrimination because of their low endorsement in our sample, but findings provide some support for the notion that the actual experience of discrimination is more important than what it is attributed to. Because these associations were examined in a relatively small number of women, replication of these results in a larger sample is warranted.

How might experiences of discrimination ultimately influence the development of visceral fat? Animal studies have found strong associations between social status stressors and visceral fat (46, 47). Although the mechanisms underlying the association are incompletely understood, evidence suggests that the hypothalamic-pituitary-adrenal axis may play a role, largely through the secretion of cortisol, which has been linked to the development of visceral fat in both animals and humans (47, 48). Human studies have found associations between psychosocial stressors and cortisol (49, 50); however, these studies have not focused on discriminatory stressors per se. Future studies should examine the role of cortisol as a possible mediator of the association between experiences of discrimination and visceral fat.

This study has limitations. Because of the SWAN study design, experiences of discrimination were not assessed at the time of the visceral fat assessment for all women. Women from the original SWAN cohort had a 0–3-year lag between assessment of discrimination and visceral fat, while women participating in only the Fat Patterning Study had concurrent assessments of discrimination and visceral fat. However, because scores on the everyday discrimination scale have been found to be relatively stable across time in SWAN (5), it is likely that a concurrent assessment of discrimination would be comparable to an assessment of discrimination 3 years earlier. We ran sensitivity analyses using discrimination scores from visits preceding the visceral fat assessment (baseline, third follow-up examination) for all SWAN women (data not shown), and findings were unchanged, suggesting that the timing of assessment of discrimination may not substantively impact our observed associations. Still, it is possible that the differential assessment of discrimination may have somehow biased our results.

An additional limitation of this study is the cross-sectional nature of our data. We excluded women who weighed 299 pounds (135.7 kg) or more and those who reported weight discrimination, which, in addition to the “unseen” nature of visceral fat, reduces the likelihood of reverse causality. When the 30 women who reported weight discrimination were included in our analyses (data not shown), the association between discrimination and visceral fat became slightly stronger, while the association between discrimination and subcutaneous fat remained nonsignificant; hence, the patterning of our results did not change. Nonetheless, longitudinal studies are needed to determine the temporality of the observed associations.

In conclusion, we report for the first known time that experiences of discrimination are associated with visceral,

but not subcutaneous, fat in African-American and Caucasian women. The mechanisms underlying this association remain to be determined; however, findings suggest that visceral fat may be one potential pathway through which experiences of discrimination increase cardiovascular risk for middle-aged women. Additional research is needed to determine whether stress-reduction interventions specifically targeting experiences of discrimination might ultimately prove beneficial for women’s cardiovascular health.

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